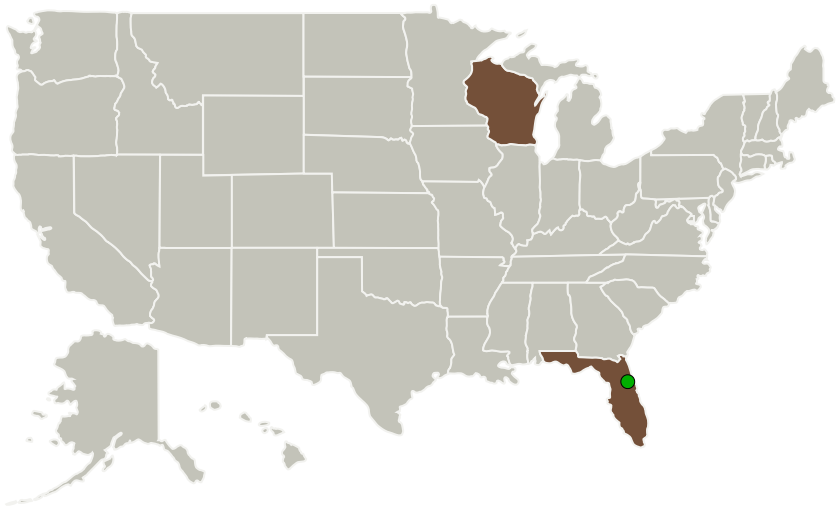
Advanced Carbothermal Electric Reactor, Phase I

Completed Technology Project (2010 - 2010)

Project Introduction

ORBITEC proposes to develop the Advanced Carbothermal Electric (ACE) reactor to efficiently extract oxygen from lunar regolith. Unlike state-of-the-art carbothermal reactors that use concentrated solar energy or laser energy to heat the regolith, the ACE reactor uses new innovative electric resistant elements to heat the regolith. The ACE reactor eliminates the problems encountered with traditional carbothermal hot-wall reactors and offers significant advantages over current carbothermal reactor approaches. By eliminating the need for a solar energy collection and delivery system, the ACE reactor offers a significantly lowers system mass and eliminates the need to keep optical surfaces clean. The ACE reactor approach can also produce the processed regolith in a form that can be directly used as a structural material. This proposal directly meets the needs of Subtopic X3.01, specifically "Advanced reactor concepts for carbothermal reduction or molten oxide electrolysis." The proposed Phase 1 Effort will define requirements, develop the heating elements, perform performance tests in a sub-scale ACE reactor, and create a preliminary design for a prototype ACE reactor that would be built and tested in Phase 2. The Phase 2 Effort will include fabrication and performance testing of the prototype ACE reactor before it is delivered to NASA.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Sierra Nevada Corporation(SNC)	Lead Organization	Industry Women-Owned Small Business (WOSB)	Sparks, Nevada
Kennedy Space Center(KSC)	Supporting Organization	NASA Center	Kennedy Space Center, Florida
Orbital Technologies Corporation	Supporting Organization	Industry Women-Owned Small Business (WOSB)	Madison, Wisconsin

Primary U.S. Work Locations	
Florida	Wisconsin

Project Transitions

January 2010: Project Start

July 2010: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140090)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Sierra Nevada Corporation (SNC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Robert J Gustafson

Co-Investigator:

Robert Gustafson

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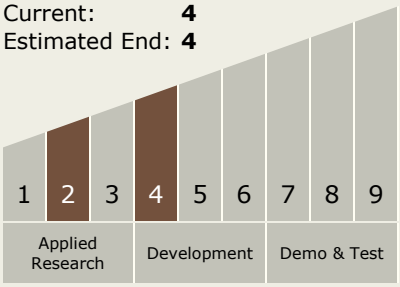
Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX07 Exploration Destination Systems
  - TX07.1 In-Situ Resource Utilization
    - TX07.1.3 Resource Processing for Production of Mission Consumables

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System